

Remote Sensing Lab

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Purpose: Students will learn about using satellite imagery and aerial photography information to solve problems and plan for the future.

Time Period: 2-3 class sessions

Grade Level: 9+

Objectives: In this activity, students will

1. explain remote sensing,
2. define bandwidths and their use in remote sensing,
3. answer questions utilizing spatial information, and
4. describe the use of remote sensing to solve a problem and plan for the future.

National Geography Standards:

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.
3. How to analyze the spatial organization of people, places, and environments on Earth's surface.
18. How to apply geography to interpret the present and plan for the future.

Indiana Academic Standards:

High School Geography and History of the World

- 9.2 – Identify regional resource issues that may impede sustainability, economic expansion and/or diversification. Assess the impact of these issues on the physical and human environments of specific regions. Propose strategies for dealing with regional resources issues.
- 9.3 – Identify and describe ways in which humans have used technology to modify the physical environment in order to settle areas in different world regions. Evaluate the impact of these technologies on the physical and human environments affected.

High School English/Language Arts

- 9.2 – Students read and understand grade-level-appropriate material. At Grade 9, in addition to regular classroom reading, students read a wide variety of nonfiction, such as biographies, autobiographies, books in many different subject areas, essays, speeches, magazines, newspapers, reference materials, technical documents, and online information.
- 9.6 - Students write using Standard English conventions.

Materials Required:

- Internet accessible computer lab
- Copies of the Remote Sensing Lab for each student or pair of students

Background Information: You may want to go through this lab prior to classroom application as it may need to be tailored for your clients. Also, you will be bettered prepared to answer questions.

Procedures:

Ask the students if they know what remote sensing means? Ask them if they know what satellite imagery or aerial photography (orthophotography) means? Discuss. Have the students briefly brainstorm why remote sensing is important: provide a couple of examples (local, regional, and global) – maybe a frequently flooding stream through your community disrupting businesses or transportation routes, invasive vegetation coverage of a lake, or permafrost changes.

Each student, or pair of students, will work through the Remote Sensing Lab.

Discuss the Lab as a group upon completion. Try to enable the students to understand the possibilities that remote sensing offers in terms of problem solving and future planning.

Assessment: Completion of the Remote Sensing Lab (with fairly accurate responses and accurate terminology) will be the only assessment tool for this project. Of course, behavior in the computer lab can always be part of the assessment!

Adaptations/Extensions:

1. Invite a GIS (geographic information systems) or remote sensing expert to visit the classroom to discuss the use of the technology as a tool to solve problems AND to discuss employment possibilities.
2. Visit with a local field specialist (Department of Natural Resources, National Weather Service, reclamation...) to discuss the use of remote sensing in solving a problem.
3. Utilize GIS and remote sensing throughout the year in student assignments.

Remote Sensing Lab

Student Name_____

Using on-line data sets can be useful in engaging students in answering geographical questions. This high school lab was created to facilitate students work in accessing remotely-sensed data. Navigate to <http://satftp.soest.hawaii.edu/space/hawaii/> to begin - this website is an educational site that helps communicate lava flow progress using remotely sensed data. The basics of remotely sensed images are explained within each tutorial. As you read, jot down any questions you may have or notes of interest.

Click on the “**Radar Tutorial**” on the right side of the screen. Navigate through each page and answer the questions below.

Page 1 notes of interest:

Page 2 notes:

Page 3 notes:

Page 4:

1) What does this mean if we want to capture remotely-sensed data from a wetland environment?

Page 6

1) How do we know the difference between types of lava flows?

Page 8

1) What do the different colors represent in these images?

Continue your tour using the “**Visible and Infrared Tutorial**” on the right.

Page 1 notes on bandwidths:

Page 3:

- 1) How does each bandwidth help us to interpret the phenomena within the image?
 - a. Coral reef-
 - b. Tropical rainforest-

Page 4:

- 1) How does the reflected light on an object impact what we see within the image:
 - a. For water:
 - b. For soil:

Page 5:

- 1) What do the **colors** within the image represent?
- 2) What is the **largest object** within the image?

Finally, Take A Virtual Fieldtrip of your choice. Note 3 interpretations of ground/water phenomena on a given island of your choice:

a.

b.

c.

Now that you have experienced satellite and aerial photography interpretation, let's take a look at some military images. Navigate to <http://www.fas.org/irp/imint/index.html>.

- 1) Click on the “**Introduction to Imagery Intelligence**” link....What is the National Image Interpretability Rating Scales?

- 2) Go back to the initial page and click on the “**hot.shots**” link. What is the **smallest object** you can see within the Reliant Stadium image? Use size, shape, patterns, tone, texture, or association to help you make an interpretation about objects within the image.

- 3) Describe the appearance in general of **3 different** sites within the image....
 - a.

 - b.

 - c.

Navigate to <http://earthobservatory.nasa.gov/Study/>

- 1) Find the links for different “Topics” on the left side of the screen. Locate and describe **3 image/data sets** for each of the categories below by clicking on that category and following the image links from there....
 - a) *Atmospheres-*

 - b) *Oceans-*

 - c) *Land-*

 - d) *Life (on Earth)-*

e) *Heat (and Energy)-*

- 2) Are you surprised by the amount and kinds of data we can collect using satellite imagery? **Why or why not?**

Water Quality

Now that you better understand the purpose and uses of remote sensing, let's study its application in water quality. Download the poster and fact sheets for the following questions using the link:

<http://rsl.gis.umn.edu/>

- 1) Read the *Minnesota Lakes: A View from Space* poster. How can we determine water clarity using satellite images from space?

- 2) Read Fact Sheet 2 on Lake Water Clarity. Why is **water clarity** an important water **quality** indicator?

- a. How do you compare the reliability of the traditional approach using a secchi disk vs. remotely sensed data?

- 3) After reading the report on Minnesota's rivers, at what point along the Mississippi River is the water the **clearest**? In other words, at what point can you see the deepest into the water?

- 4) Using the article, answer the following questions:

- a. Can I determine the level of pollution in a river using remotely sensed images? Yes or no? If so, how/If not, why not?
- b. Why might it be important to use 'ground-truthing', i.e. field studies/field work, to support findings within an image of water quality?

- 5) Read Fact Sheet #1 on Impervious Surfaces. How can we measure the amount of impervious surface using aerial photographs? And, why is this important to determining water quality within a community?
- 6) After reading Fact Sheet #3 answer the following questions:
- a. Is remotely sensed data cost effective? Why or why not?